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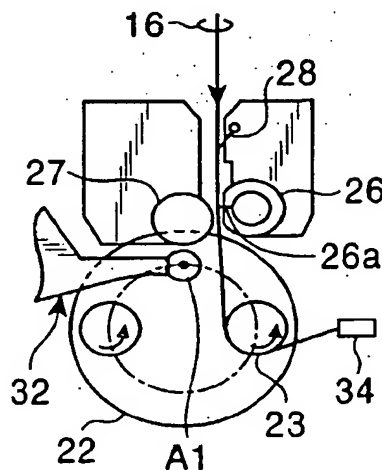
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(54) Yarn threading methods for a take-up winder

(57) The present invention provides a yarn threading method for a take-up winder which allows yarn to be threaded without fail by winding the yarn around a bobbin set on a bobbin holder. A bobbin holder 23 is moved to a position off a winding position A1 to thread a yarn to start winding it around a bobbin set on the bobbin holder 23. If a supporting member corresponding to the winding position A1 is available, it is preferable that the bobbin holder 23 be moved to a position where the path of yarn to be wound the bobbin does not intersect the supporting member 32 as viewed from the tip of the bobbin holder 23. If the yarn is adhesive, the bobbin holder is preferably moved before the yarn leaves a touch roller 27.

FIG. 1C



YARN THREADING

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Description

Field of the Invention

[0001] The present invention relates to a yarn threading method for a take-up winder which allows a pair of bobbin holders to be switched between a winding position and a standby position and further allows a touch roller to be pressed against a bobbin set on the bobbin holders in the winding position, and especially to a failure-free method of threading yarn by winding it around a bobbin set on the bobbin holders.

Background of the Invention

[0002] It is common practice to use a yarn threading device to thread a yarn for a take-up winder at the beginning of winding. In the yarn threading device, as many yarn threading members as bobbins set on a bobbin holder are slidably disposed along guide member, and by pushing and pulling a rod, the yarn threading members are switched between an integration position at which the yarn threading members can be operated at the front and a distribution position at which the yarn threading members take when moved to the slits of their respective bobbins, and the yarn threading device is positioned so that it does not interfere with the bobbin holder which can alternately be switched between a winding position and a standby position. The yarn threading method using the yarn threading device comprises several steps, namely, preparing a plurality of yarns ready to suck by using a suction gun at the beginning of winding, threading the yarn on each yarn threading member in the integration position to this side, setting the yarn threading members in the distribution position taken by the yarn threading members when moved to the slits of their respective bobbins, carrying all yarns from their distributed positions by using a yarn assembly cover etc. with respect to bobbins on the bobbin holder in the winding position, inserting the yarns into the bobbin slits, and starting winding.

[0003] However, both because an expandable yarn such as elastic yarn is not always inserted into the bobbin slit satisfactorily and because special equipments, including a yarn threading device, is required, an alternative method in which yarn is wound around a bobbin inserted in the bobbin holder to start winding is sometimes used.

[0004] Referring now to Figure 7, the alternative method is described below.

[0005] A bobbin holder b in a winding position and a bobbin holder c in a standby position are configured to protrude from a turret disc a such that the two holders can be switched with one other. An elevating box d, which can ascend and descend with respect to the bobbin holder b in the winding position, is provided with a touch roller e and a traverse device f. By lifting the elevating box d to the solid line in Figure 7 and by causing

a yarn removal guide g to bounce upward, a yarn is prevented from touching a traversing guide of the traverse device f. The yarns from a godet roller (not shown in the drawing) are drawn collectively into a suction gun h. Using the suction gun h, the yarns are wound around a bobbin on the bobbin holder b, rotating in a winding direction at the winding position, to transfer the yarn to the bobbin. Because the yarn tends to run in a straight line, the yarn is wound around one section of each bobbin (straight winding) on the bobbin holder b. Then, the yarn removal guide g is lowered and the yarn running to each bobbin is traversed. And then, the bobbin holder b in the winding position and the bobbin holder c in the standby position are switched by turning the turret disc a by 180 degrees, and the yarn is transferred to a bobbin in a new bobbin holder in the winding position using a yarn transferring device (not shown in the drawing), as required to complete the yarn transfer. The bobbins around which firstly the yarns are wound and the straight winding are formed, are removed from the bobbin holder, and new bobbins are set. As described above, this method adds the bobbin replacement for the bobbin holder while eliminating the need for a special yarn threading device.

[0006] For the yarn threading method which starts threading yarns by winding them around the bobbin at the tip of the bobbin holder as described above, the operator must skillfully wind the yarns, sucked into the suction gun h, around the bobbin at the tip of the bobbin holder. However, the operator may fail to thread the yarn as desired because of interference from the touch roller e in the elevating box d or the traverse device f. Also, highly adhesive yarn, such as elastic yarn, may wind around the touch roller e, causing the operator to fail to thread it. Finally, if a supporting member is provided which supports the tip of the bobbin holder in the winding position, the supporting member prevents the yarn from being wound around the bobbin at the tip of the bobbin holder.

[0007] The present invention has been prepared to solve these problems with the prior art, and is intended to provide a yarn threading method for a take-up winder which allows a yarn to be threaded without fail by winding the yarn around a bobbin set on a bobbin holder. The term "yarn threading" means to set a yarn on an empty bobbin before starting to wind it in a take-up winder.

Summary of the Invention

[0008] To solve the above-mentioned problem, a yarn threading method for a take-up winder of the present invention allows a pair of bobbin holders to be switched between a winding position and a standby position, and further allows a touch roller to be pressed against a bobbin set on the bobbin holder in the winding position, wherein the bobbin holder is moved to a position off the winding position to thread the yarn to start winding the

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yarn around the bobbin set on the bobbin holder.

[0009] When the bobbin holder leaves the winding position, a spatial margin is provided around the bobbin holder. Because the take-up winder has a rotating mechanism comprising a turret disc which switches the bobbin holder between the winding position and the standby position, the bobbin holder can be moved to a position off the winding position by using the rotating mechanism. This position off the winding position is not the standby position, since the winding position and the standby position can be switched with each other.

[0010] In a yarn threading method for a take-up winder of the present invention, a removable supporting member which supports the tip of the bobbin holder in the winding position exists, and the bobbin holder is moved to a position where the path of yarn to be wound around the bobbin does not intersect the supporting member as viewed from the tip of the bobbin holder.

[0011] Since a cantilever type bobbin holder must be long to install many bobbins therein, the bobbin holder is supported at both ends by using a supporting member, which supports the both end of the bobbin holder. In this case, if the bobbin holder is in the winding position, the supporting member prevents the yarn from being wound around the bobbin at the tip of the bobbin holder. However, moving the bobbin holder to a position where the path of yarn to be wound around the bobbin does not intersect the supporting member as viewed from the tip of the bobbin holder makes it possible to wind yarn around the bobbin at the tip of the bobbin holder.

[0012] In a yarn threading method for a take-up winder of the present invention, the bobbin holder is moved to the side on which the yarn separates from the touch roller if the godet roller upstream of the touch roller has a higher circumferential speed than the touch roller.

[0013] An elastic yarn is overfed to give the upstream godet roller a higher circumferential speed than the touch roller, which is in contact with the bobbin holder in the winding position. In this case, if the yarn comes in contact with the touch roller when threaded, the yarn may be drawn around the touch roller. Moving the bobbin holder to the side on which the yarn separates from the touch roller prevents the yarn from being drawn around the touch roller.

[0014] A yarn threading method for a take-up winder of the present invention is a method wherein the yarn is adapted so that it is traversed across each bobbin after being wound around the bobbin on the bobbin holder in a position off the winding position, and then is automatically transferred to a bobbin on the other bobbin holder to complete a threading process.

[0015] A mass of the yarn formed at the beginning of winding, a yarn obliquely wound until it reaches each bobbin, and a straight winding before a yarn is traversed remain in the bobbin holder in a position off the winding position. Thus by using an automatic yarn-transfer function (automatic revolution function) which is inherent to a take-up winder of this type, a bobbin on a bobbin

holder on which irregular yarn windings remain is assumed to be full bobbin, such that the yarn is automatically transferred to the bobbin, and doing so completes yarn transfer. A bobbin on a bobbin holder on which incompletely wound yarn remains is replaced with a new bobbin, in preparation for the next automatic revolution.

[0016] A yarn threading method for a take-up winder of the present invention is a method wherein the automatic yarn transfer is performed by switching the position of the pair of bobbin holders so that the angle of contact of a yarn running to one bobbin holder with a bobbin on the other bobbin holder is larger than when the other bobbin holder is in the winding position, and by setting the other bobbin holder in the winding position after the yarn is transferred from a bobbin on one bobbin holder to a bobbin on the other bobbin holder.

[0017] Switching the position of a pair of bobbin holders so that the angle of contact of highly adhesive yarn, such as elastic yarn, running to one bobbin holder with a bobbin on the other bobbin holder helps the yarn adhere to the other bobbin holder, thus facilitating the yarn transfer. Thus, moving a bobbin holder using the automatic revolution function causes the yarn transfer, and setting the bobbin holder to which the yarn is transferred in the winding position completes the yarn threading.

Brief Description of the Drawing

[0018]

Figure 1 shows the steps in a yarn threading method of the present invention.

Figure 2 shows the steps in a yarn threading method of the present invention.

Figure 3 is a side view showing yarns that is to be wound around a bobbin holder.

Figure 4 is a side view showing yarn that has been wound around a bobbin holder.

Figure 5 is a front view of a take-up winder to which a yarn threading method of the present invention applies.

Figure 6 is a side view of a take-up winder to which a yarn threading method of the present invention applies.

Figure 7 is a front view showing a conventional yarn threading method.

Detailed Description of the Preferred Embodiments

[0019] Referring now to the drawings, an embodiment of the present invention is described below. Figures 1 and 2 show a yarn threading process of the present invention.

[0020] Referring to Figures 5 and 6, the components and operating principle of a take-up winder to which a yarn threading method of the present invention applies

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are described. Figure 5 shows a front view of a take-up winder for an elastic yarn and godet rollers, and Figure 6 shows a side view of a take-up winder for an elastic yarn and godet rollers.

[0021] A godet roller unit 1 is composed of a first godet roller 11 and a second godet roller 13 from its upstream side to downstream side.

[0022] A set of filament yarns spun by a melt spinning machine 17 are threaded in order through the first godet roller 11 and the second godet roller 13, and led to a take-up winder 2.

[0023] The take-up winder 2 is composed mainly of a turret disc 22 which is rotatably attached to a side of a body frame 21, two bobbin holders 23 and 24 which are rotationally driven by an induction motor (not shown in the drawings) and projected like a cantilever from the turret disc 22, an elevating box 25 which can ascend and descend at right angles to the body frame 21, a traverse device 26 which is installed in the elevating box 25, and a touch roller 27 which is attached to the elevating box 25.

[0024] Many bobbins (sixteen bobbins are illustrated) are set on the bobbin holders 23 and 24. One of the bobbin holders 23 and 24 is disposed at a winding position A1, and the other is disposed at a standby position A2, and the yarn is wound around the bobbins B on the bobbin holder in the winding position A1. Every time yarn is wound around a bobbin B to its full capacity, the turret disc 22 is turned 180 degrees to automatically transfer the yarn from the bobbin B to an empty bobbin B moving to the winding position A1 and restart yarn winding. These steps of winding provide the take-up winder 2, which is of a revolving type. Thus, the turret disc 22 has a rotating drive mechanism (not shown in the drawings), which can turn through a predetermined angle about a center axis 29. The yarn from a second yarn guide 16 is guided by a reciprocating guide 26a of the traverse device 26 and wound around the bobbin B while being traversed over a predetermined width. Figures show the take-up winder 2 as viewed immediately after a bobbin on the bobbin holder in the winding position A1 becomes full, so that the yarn is automatically transferred by turning the turret disc 22 180 degrees.

[0025] In addition to the touch roller 27 and the traverse device 26, a yarn removal guide 28 is supported in the elevating box 25. The touch roller 27, which is always pressed against the yarn layer on the bobbin B in the winding position A1, is complementarily driven to prevent the touch roller 27 from rotating more slowly than the bobbin B rotating counterclockwise in Figure 5. The yarn removal guide 28 is intended to prevent the yarn Y from reciprocating by removing it from the yarn guide 26a of the traverse device 26. Setting the yarn removal guide 28 in a withdrawal position as shown in Figure 5 causes the yarn Y from the godet roller unit 1 to be threaded through the yarn guide 26a of the traverse device 26, thus automatically starting yarn Y's traverse.

[0026] From the body frame 21, a stationary frame 30 is projected diagonally upward from the turret disc 22 and in parallel with the elevating box 25 to position the stationary frame 30 so that it does not interfere with the movement of the elevating box 25. A control box 31 is provided at the tip of the stationary frame 30, and under the stationary frame 30, a supporting member 32 is disposed. The supporting member 32, which removably supports the tip side of the bobbin holder 23 in the winding position A1, is arranged so that a cylinder device 32c allows an arm 32b having retainer 32a to move back and forth in the direction of the axis of the bobbin holder 23. If the cantilever type bobbin holder 23 is too long, it easily vibrates. Thus the supporting member 32 is intended to support the bobbin holder 23 in the winding position A1 at two tips by supporting the both ends thereof. 33 is to a bobbin pushing device which pushes a bobbin out of the bobbin holder 24 in the standby position A2. 16 is a yarn guide for yarn threading which is placed in a withdrawal position during yarn winding.

[0027] Below, a yarn threading method is described of an adhesive and expandable elastic yarn at the beginning of the winding process through the godet roller unit 1 and the take-up winder 2.

[0028] Figure 1 shows the steps employed in a yarn threading method of the present invention and Figure 2 also shows the steps employed in a yarn threading method of the present invention. Figure 3 is a side view showing yarn which is to be wound around a bobbin on a bobbin holder and Figure 4 is a side view showing yarn which has been wound around a bobbin on a bobbin holder.

[0029] Figure 1 shows steps to install a yarn around a bobbin on one bobbin holder and Figure 2 shows steps to transfer the yarn from the bobbin of one bobbin holder to a bobbin on the other bobbin holder. Figure 1A shows steps to turn the turret disc 22 counterclockwise by 90 degrees to level the pair of bobbin holders 23 and 24 by moving them. Before the turret disc 22 is turned, the elevating box 25 is lowered to such a position that the touch roller 27 in the elevating box 25 can be pressed against the bobbin in the winding position A1. Moreover, the arm 32b of the supporting member 32 is moved in the direction to this side in Figure 1A to disengage the arm 32b from the tip of the bobbin holder 24. In addition, the pair of bobbin holders 23 and 24 is rotationally driven as shown in Figure 1B to obtain a predetermined circumferential speed.

[0030] When wound around a bobbin on the bobbin holder 23, the yarn is located so that its path does not intersect the supporting member 32 as viewed front the tip of the bobbin holder 23. Thus the supporting member 32 does not prevent the yarn from being wound around the bobbin on the bobbin holder 23. The bobbin holder 23 is moved to the side where the yarn to be wound around the bobbin on the bobbin holder 23 separates from the side face of the touch roller 27. For the elastic yarn, in Figure 5, it is usual for an overfeed oper-

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ation to be performed during which the second godet roller 13 has a higher circumferential speed than the touch roller 27. If a long length of a slightly overfed and adhesive yarn is in contact with the side of the touch roller 27, it becomes wound around the touch roller, thus causing yarn threading to fail, and moreover, the touch roller becomes troublesome to clean. Assuming that the supporting member 32 extends from the side of the stationary frame 30, the position to which the bobbin holder 23 is moved meets the two conditions described above, no practical problem is posed if this position is opposite to the stationary frame 30 as viewed from the touch roller 27 and within ± 45 degrees of the horizontal position. However, as illustrated, the horizontal position is preferable that is as far away from the touch roller 27 and the supporting member 32 as possible.

[0031] A suction gun 34 sucks in all yarns drawn out through the yarn guide 16. The operator moves the suction gun 34 by hand to carry the yarns through the gap between the touch roller 27 and the traverse device 26 to the bobbin holder 23. The yarn removal guide 28 is set in the operating position so that the yarns are not caught on the guide 26a of the traverse device 26 when the yarns are carried. Figures 1C and 3 show the state as described above. Many take-up winders 1 in Figure 3 are disposed in a row in the direction of page thickness, and the yarn can be threaded from the front side of the take-up winder (on the left of Figure 3) only. Thus the bobbin holder 23 must be in an accessible position to move the suction gun 34 from the front side of Figure 1C.

[0032] When by the suction gun 34, the yarns are wound in a direction a2 around a bobbin on the bobbin holder 23, rotationally driven in a direction a1 in Figure 3, the yarns are wound around a bobbin on the bobbin holder 23, and the yarns running to the suction gun 34 break. Then the yarns from the guide 16 for yarn threading move in the direction indicated by an arrow a3 to run directly downward. When the yarn installation is completed by winding yarn as shown in Figure 1C, as shown in Figure 4, the yarn is wound in straight winding around each bobbin B on the bobbin holder 23. The guide 16 for yarn threading moves to the withdrawal position thereof. When the yarn removal guide 28 in Figure 1C is set in the withdrawal position, the yarn running to each bobbin is installed on the guide 26a of the traverse device 26 to traverse the yarn. In Figure 4, the broken line (composed of alternating long and two short dashes) represents the yarn. However, because the yarn wound around the bobbin on the bobbin holder 23 in Figure 4 includes the yarn running obliquely across bobbins and the yarn wound in straight winding, the yarn does not constitute a finished product. To prevent this problem, the automatic revolution function of the take-up winder is used to immediately restart regular winding.

[0033] Figure 2 illustrates how regular winding is restarted using the automatic revolution function inherent to the take-up winder. Figure 2 shows automatic

yarn transfer using the adhesive properties of the elastic yarn. The turret disc 22 is turned counterclockwise by 360 degrees from its position in Figure 1C. By doing so, the yarn wound around a bobbin on the bobbin holder 23 is wound around a bobbin on the bobbin holder 24. Then an adhesive yarn, such as elastic yarn, is drawn around the bobbin on the bobbin holder 24, and the yarn running to the bobbin on the bobbin holder 23 breaks. Figure 2A shows this situation. Next, the turret disc 22 is turned clockwise by 90 degrees to press the bobbin on the bobbin holder 24, to which the yarn has been transferred, against the touch roller 27. The traversed yarn is wound around the bobbin on the bobbin holder 24, thus meeting the conditions under which the yarn is transferred from a full bobbin to an empty bobbin, and the yarn is regularly wound around the bobbin on the bobbin holder 24 in Figure 2B, and at which the regular winding starts. At the beginning of regular winding, the supporting member 32 supports the tip of the bobbin holder 24 in the winding position to support the bobbin holder at two tips, thus preventing the take-up winder from vibrating. Because the bobbin on the bobbin holder 23 in Figure 2B is irregular, the bobbin pushing device 33 in Figure 6 pushes out the bobbin, and a doffing device (not shown in the drawing) automatically replaces it with a new empty bobbin.

[0034] When yarn winding proceeds as shown in Figure 2B until the bobbin on the bobbin holder 24 in the winding position becomes full, the tip of the bobbin holder 24 is no longer supported by the supporting member 32, and the turret disc 22 is turned clockwise by 270 degrees. Then the yarn is wound around the empty bobbin on the bobbin holder 23 as shown in Figure 2A, and the yarn is automatically transferred from the full bobbin to the empty bobbin. Once the operator completes moving a bobbin holder to a position off the winding position and winding yarn from the tip side of the bobbin holder, yarn threading is automatically completed, and the automatic revolution function ensures that bobbins are filled one after another.

[0035] The present invention is not limited to the embodiment described above. Naturally, various modifications and variations can be made without departing from the scope of the present invention. Although a yarn threading method for a take-up winder has been described in terms of elastic yarn above, the present invention can also apply to, for example, take-up winders used to wind ordinary filaments made of polyester, nylon, and other similar materials.

[0036] Because a yarn threading method for a take-up winder according to the present invention threads a yarn around an empty bobbin on a bobbin holder by moving the bobbin holder to a position off the winding position to start yarn winding, the method provides adequate space between the bobbin holder around which the yarn is threaded and the other equipment, helps operations by equipping the operator with a suction gun, and increases the probability of yarn being threaded

without failure. The method also allows a bobbin holder to be moved to any position off the winding position by using a rotating mechanism of a turret disc switching the bobbin holder between the winding position and the standby position, with no special mechanical device added.

[0037] Because, even if a supporting member for supporting both tips of the bobbin holder is applied, a yarn threading method for a take-up winder according to the present invention allows the yarn to be wound when the bobbin holder is moved to a position where the path of yarn to be wound around the empty bobbin does not intersect the supporting member as viewed from the tip of the bobbin holder, the method increases rigidity of the long bobbin holder and helps operations by equipping the operator with a suction gun.

[0038] A yarn threading method for a take-up winder according to the present invention moves a bobbin holder to a position at which yarn separates from a touch roller even for elastic yarn which is easily drawn around the touch roller when the yarn touches the touch roller in contact with the bobbin holder, thus helping operations by equipping the operator with a suction gun. Because of this, the method prevents failures in yarn threading due to yarn adhesion to the touch roller, even under conditions under which elastic yarn is slightly overfed to a yarn winder.

[0039] A yarn threading method for a take-up winder according to the present invention allows a necessary procedure to proceed automatically, thus completing yarn threading by transferring yarn from a bobbin on a bobbin holder, on which yarn transitionally wound immediately after yarn threading is removed, to a bobbin on a bobbin holder around which yarn is wound regularly from the beginning, by using an automatic revolution function which switches the winding position and the standby position as needed.

[0040] A yarn threading method for a take-up winder according to the present invention completes yarn threading quickly and without fail by moving bobbin holders successively, because yarn transfer is completed when the position of a pair of bobbin holders is switched, thereby increasing the angle of contact at which adhesive yarn, such as elastic yarn, running to a bobbin on one bobbin holder comes in contact with a bobbin on the other bobbin holder.

Claims

1. A yarn threading method for a take-up winder which allows a pair of bobbin holders to be switched between a winding position and a standby position and further allows a touch roller to be pressed against a bobbin set of the bobbin holder in the winding position, wherein said bobbin holder is moved to a position off said winding position to thread a yarn to start winding yarn around the bobbin set on the bobbin holder.

2. A yarn threading method for a take-up winder according to claim 1, wherein a removable supporting member exists which supports the tip of the bobbin holder in said winding position, and said bobbin holder is moved to a position where the path of yarn to be wound around said bobbin does not intersect said supporting member as viewed from the tip of said bobbin holder.

3. A yarn threading method for a take-up winder according to claim 1 or claim 2, wherein said bobbin holder is moved to the side on which a yarn separates from said touch roller if the godet roller upstream of said touch roller has a higher circumferential speed than said touch roller.

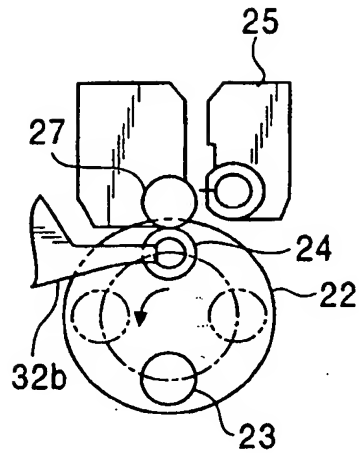
4. A yarn threading method for a take-up winder according to any one of claims 1 through 3, wherein a yarn is adapted so that it is traversed across each bobbin after being wound around a bobbin on the bobbin holder in a position off the winding position, and then is automatically transferred to a bobbin on the other bobbin holder to complete a threading process.

5. A yarn threading method for a take-up winder according to claim 4, wherein an automatic yarn transfer is performed by switching the position of said pair of bobbin holders so that the angle of contact of yarn running to one bobbin holder with a bobbin on the other bobbin holder is larger than when the other bobbin holder is in the winding position, and by setting said other bobbin holder in the winding position after a yarn is transferred from a bobbin on one bobbin holder to a bobbin on the other bobbin holder.

6. A yarn threading method for a take-up winder according to any one of claims 1 through 5, wherein the yarn to be wound is elastic yarn.

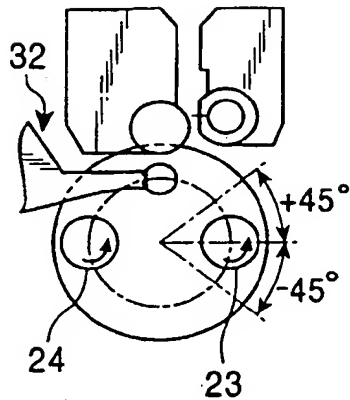
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FIG. 1A



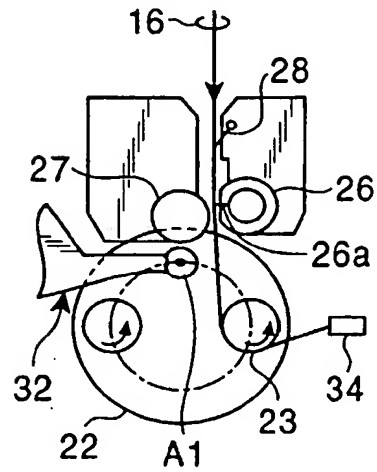
90 DEGREES
COUNTERCLOCKWISE
REVOLUTION

FIG. 1B



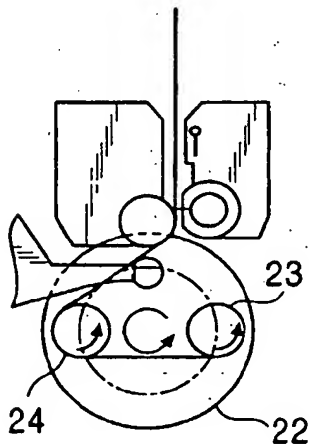
BOTH BOBBIN
HOLDERS START
TO BE ACCELERATED

FIG. 1C



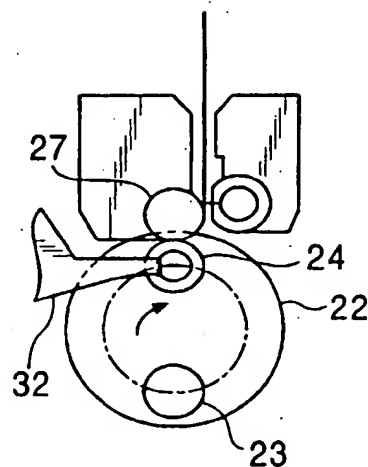
YARN THREADING

FIG. 2A



360 DEGREES
COUNTERCLOCKWISE
REVOLUTION

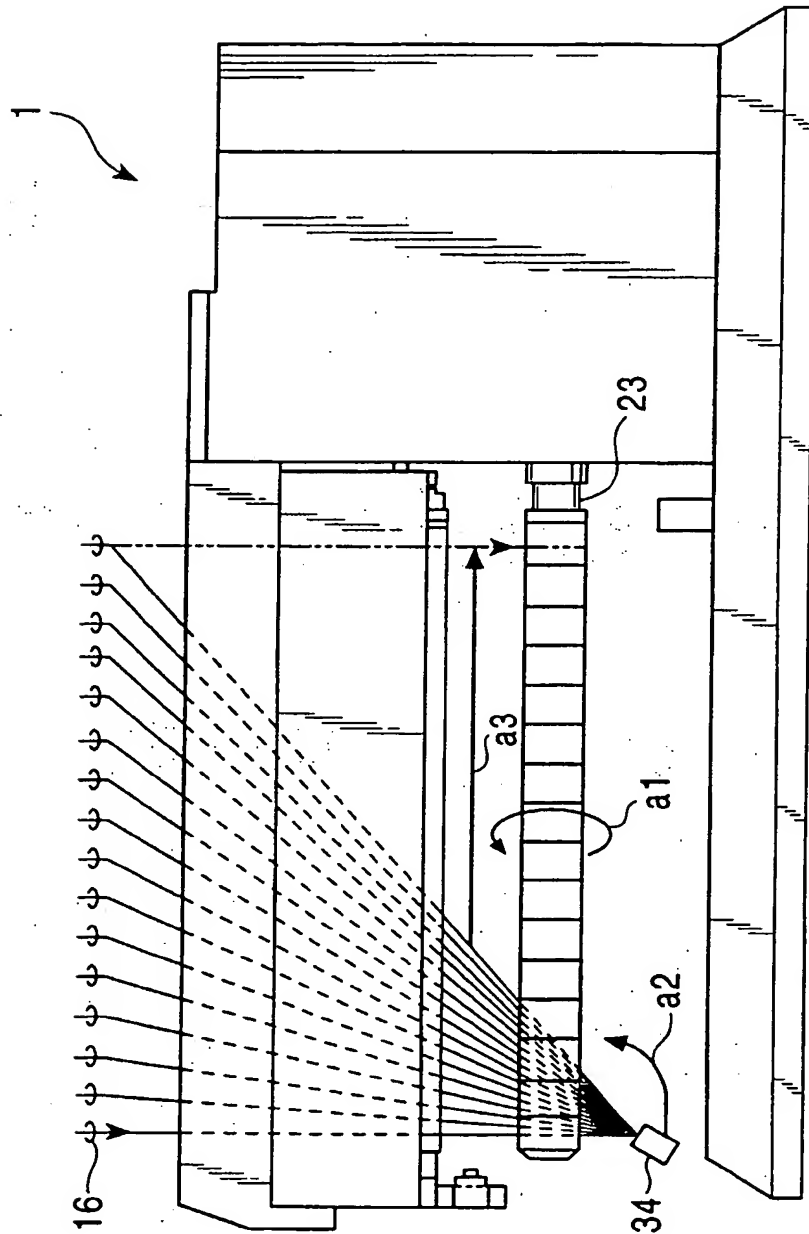
FIG. 2B



90 DEGREES
CLOCKWISE
REVOLUTION

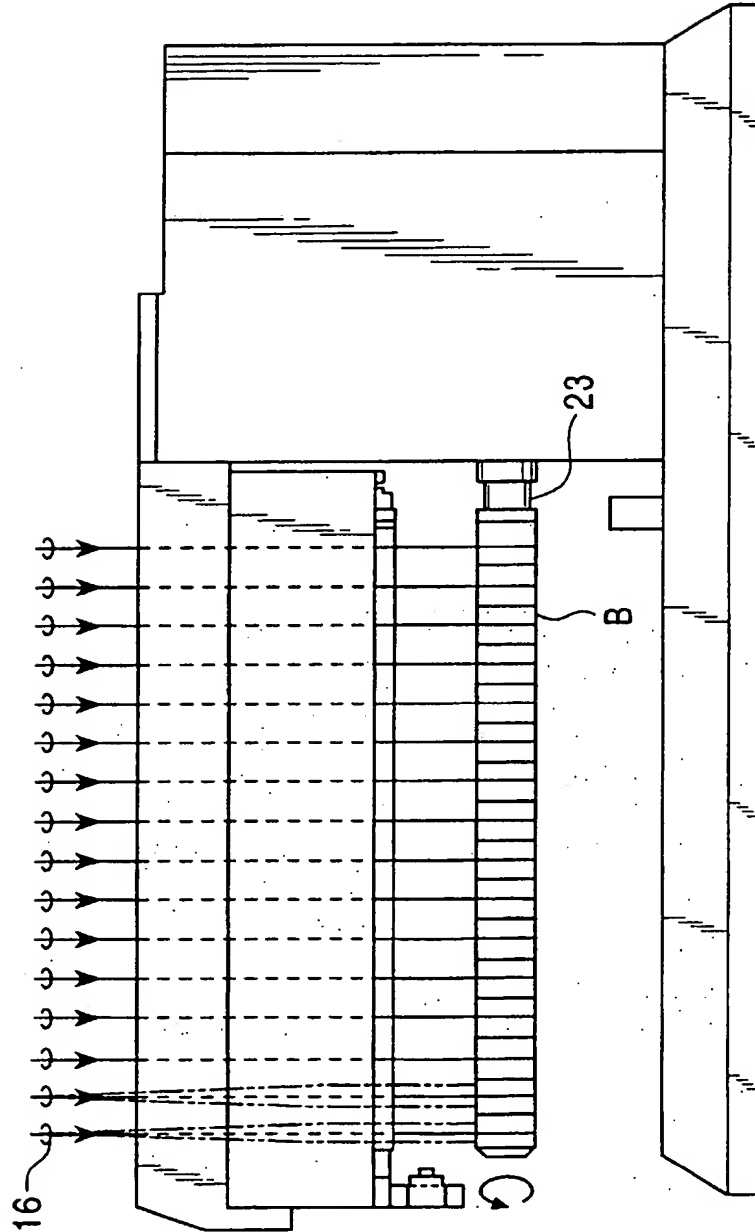
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FIG. 3



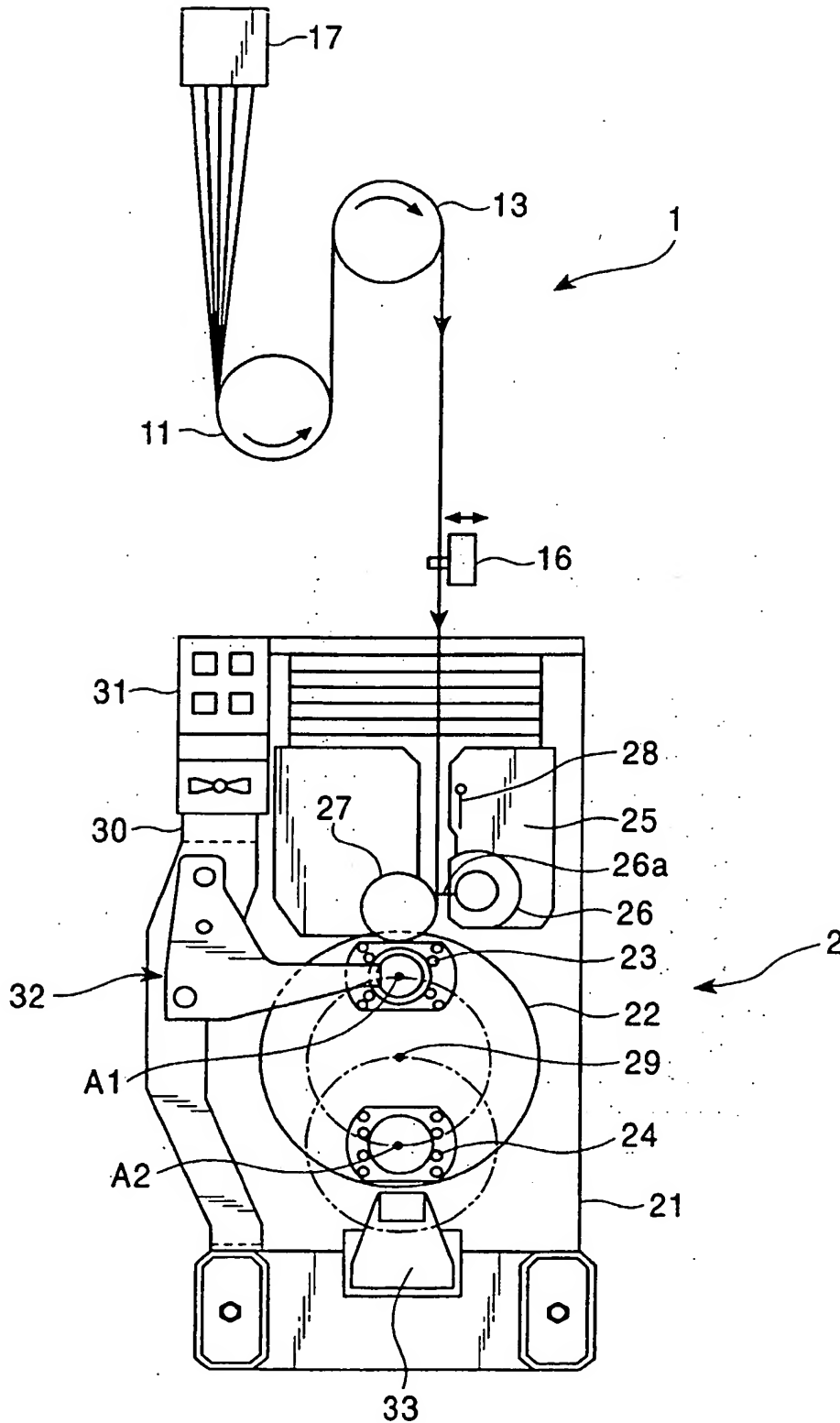
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FIG. 4



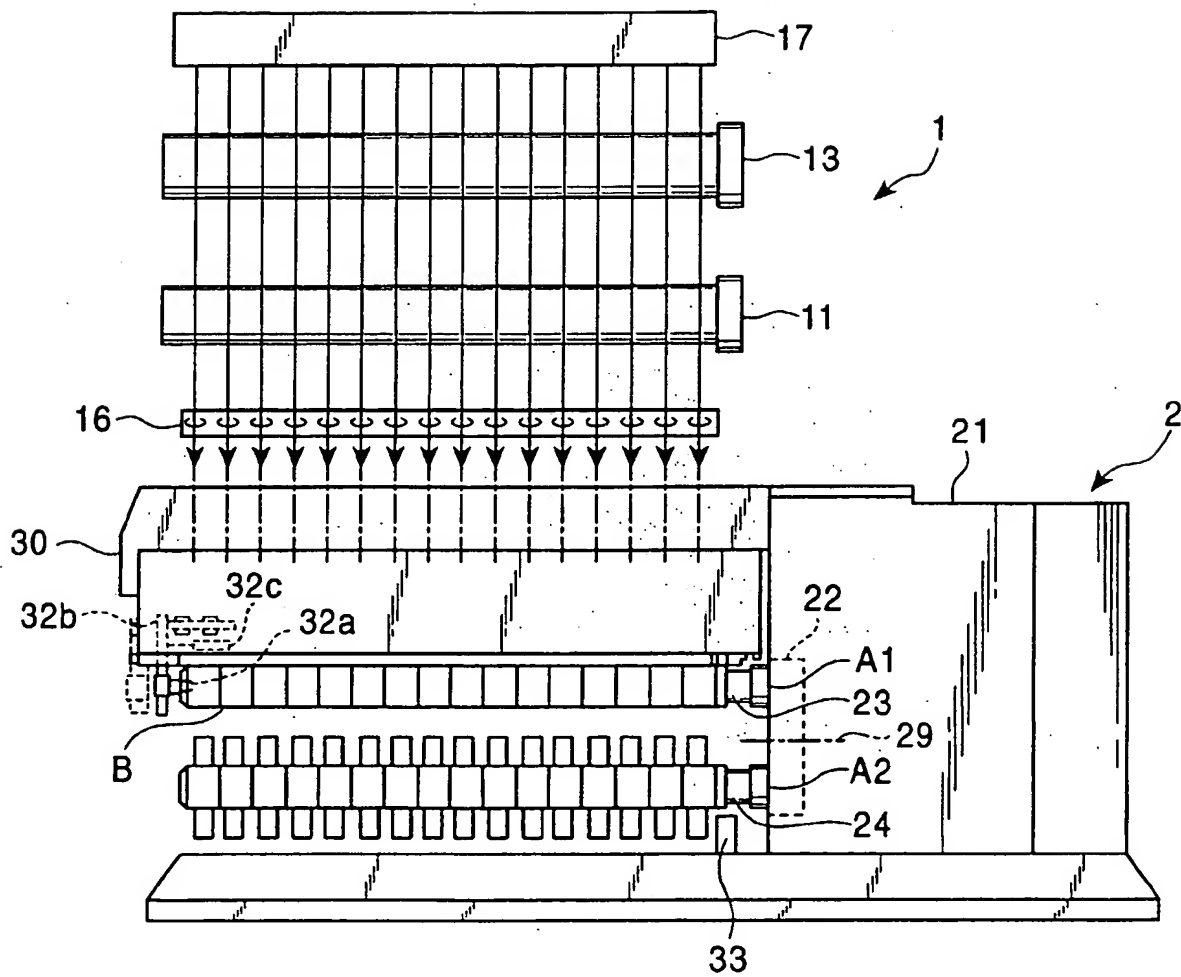
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FIG. 5



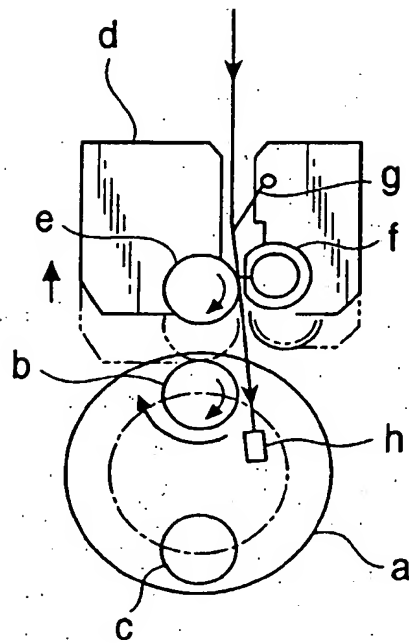
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FIG. 6

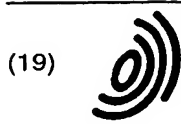


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FIG. 7
PRIOR ART



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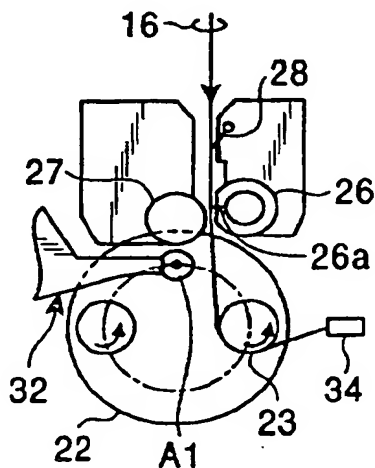
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(54) Yarn threading methods for a take-up winder

(57) The present invention provides a yarn threading method for a take-up winder which allows yarn to be threaded without fail by winding the yarn around a bobbin set on a bobbin holder. A bobbin holder 23 is moved to a position off a winding position A1 to thread a yarn to start winding it around a bobbin set on the bobbin holder 23. If a supporting member corresponding to the winding position A1 is available, it is preferable that the bobbin holder 23 be moved to a position where the path of yarn to be wound the bobbin does not intersect the supporting member 32 as viewed from the tip of the bobbin holder 23. If the yarn is adhesive, the bobbin holder is preferably moved before the yarn leaves a touch roller 27.

FIG. 1C



YARN THREADING

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EP 0 985 621 A3



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EUROPEAN SEARCH REPORT

Application Number
EP 99 11 7570

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25 September 2000	Examiner Goodall, C
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document</p> <p>T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document</p>			

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